MODIS DATA SYSTEM STUDY

TEAM PRESENTATION

October 14, 1988

AGENDA

1. Status of the MODIS Data System Study
2. Response of Joel Susskind to the MODIS Data System Requirements Questionnaire
3. Conceptualization of Processing to Support User Queries of Available Products
4. Action Items

STATUS OF THE MODIS DATA SYSTEM PHASE-B STUDY

The package of September deliverables is being assembled, and will be copied and distributed before the next MODIS meeting. The deliverables include:

- **The MIDACS Functional Requirements Document**
- **The MIDACS Data Flow Report**
  - Context Diagrams
  - Data Flow Diagrams
  - Data Dictionary
- **The Preliminary Instrument Calibration Plan**
- **The DADS Operations Concepts**

Deliverables in progress for the month of October include: (1) the Preliminary Data Processing Plan, (2) the Preliminary Level-4 Requirements, (3) a Preliminary Configuration and Cost Analysis, and (4) the User Access Operations Concepts.

In support of the work related to the latter, a meeting has been scheduled with Sol Broder for Monday morning at 10:30 to discuss communications requirements of a distributed TMCF.

A meeting is also required with members of the MODIS Instrument Team to develop a set of requirements relating to MIDACS data bases; specifically to the needs for browse data and metadata.

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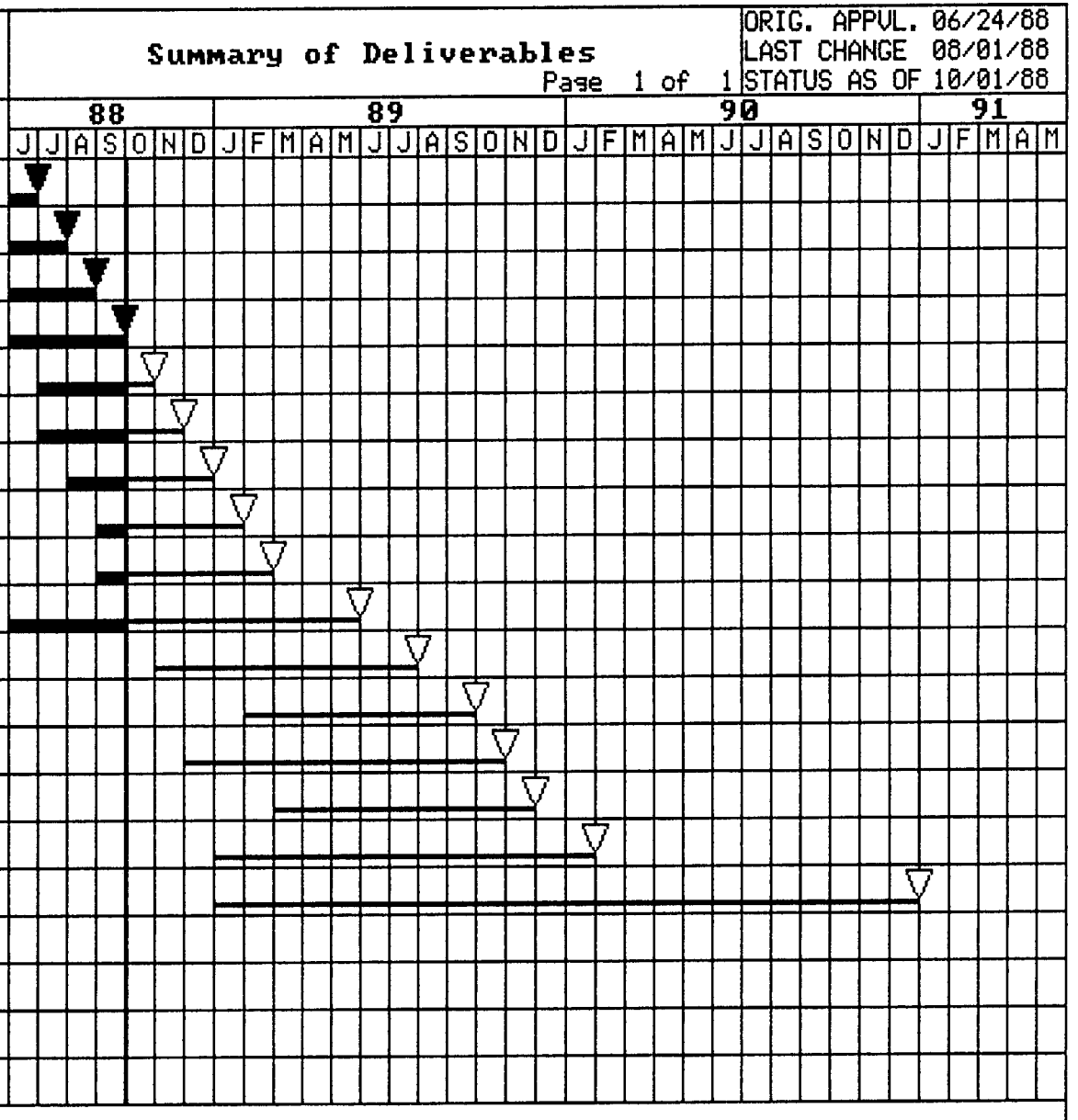
Summary of Deliverables

ORIG. APPVL. 06/24/88
LAST CHANGE 08/01/88
STATUS AS OF 10/01/88



Note:

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WBS - 2000

Page 1 of 1

ORIG. APPVL. 07/01/88
LAST CHANGE 10/01/88
STATUS AS OF 10/01/88

	MILESTONES	88 J	J	A	S	O	N	D	89 J	F	M	A	M
01	2000 Req'ts Anlysis Study Plan												
02	2100 User Data Product Req'ts												
03	2200 MIDACS Operations Concept												
04	2300 MIDACS Operations Req'ts												
05	2400 System Performance Req'ts												
06	2500 MIDACS Functional Req'ts												
07	2640 Prelim L4 Requirements												
08	2650 Prelim Data Requirements												
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Note:
1 - Required Deliverable

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WBS 3000

ORIG. APPVL. 07/01/88
LAST CHANGE 10/01/88
STATUS AS OF 10/01/88

	MILESTONES
01	3000 Architecture Study Plan
02	3100 EosDIS Architecture Rev
03	3200 MIDACS External I/F Rep't
04	3300 MIDACS Data Flow Report
05	3420 Configur'n Cost Analysis
06	3450 Arch Trade Study Report
07	3500 Prelim Sys Specification
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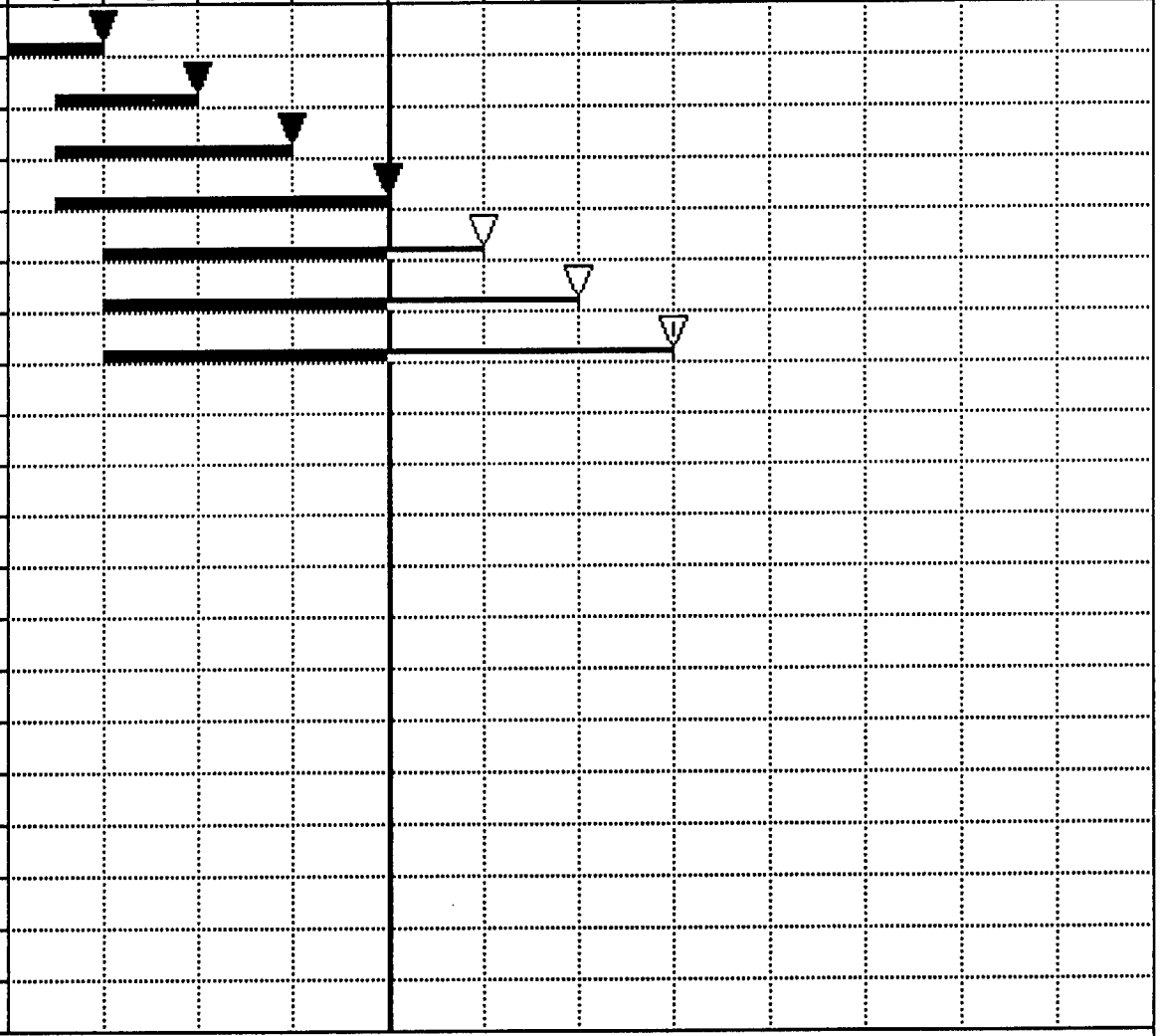

Note:
1 - Required Deliverable

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WBS 4000

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ORIG. APPVL. 07/01/88
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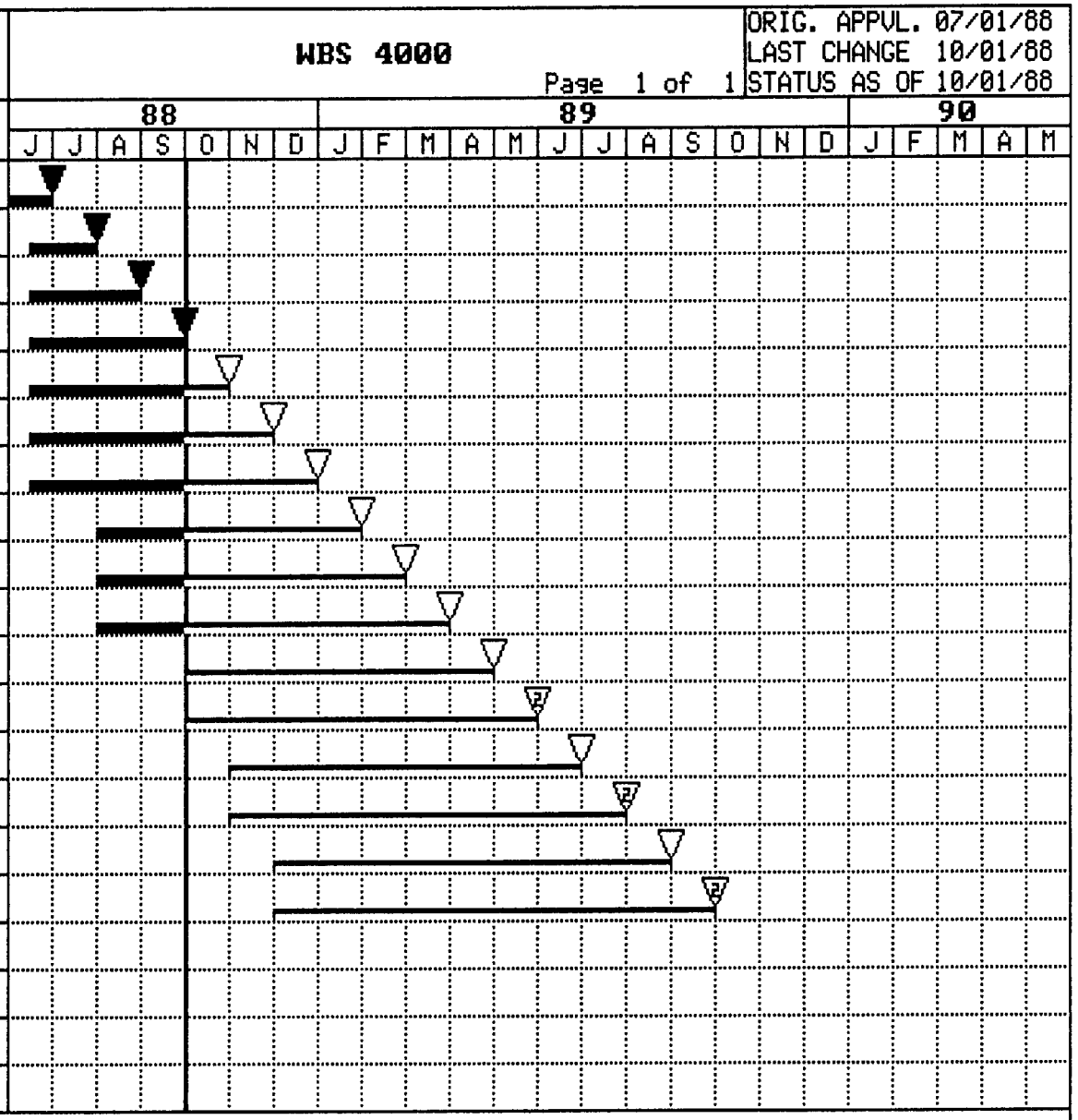
STATUS AS OF 10/01/88



Note:
2 - Supporting Deliverable

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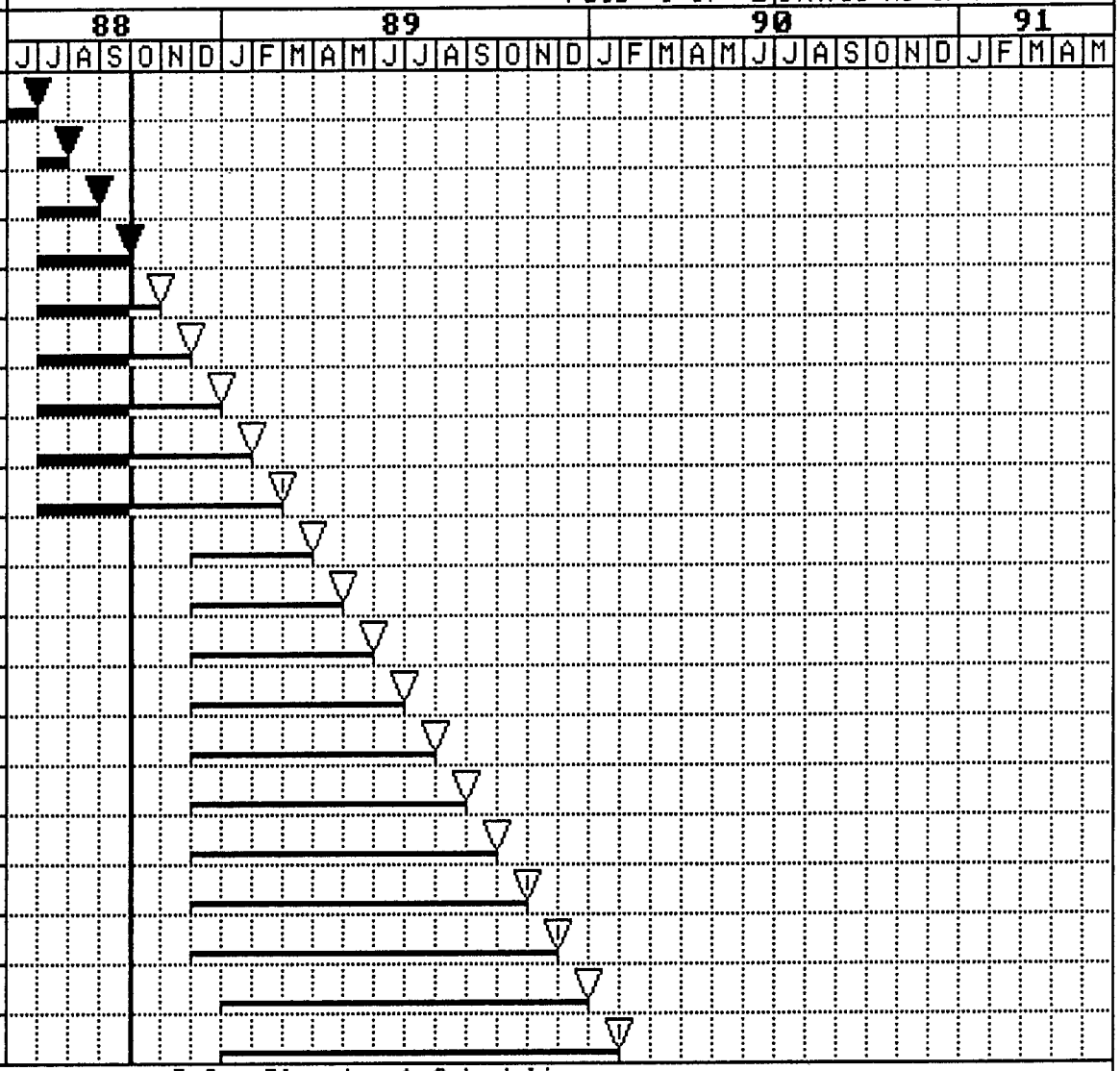
WBS 5000

ORIG. APPVL. 07/01/88
LAST CHANGE 10/01/88
STATUS AS OF 10/01/88

MILESTONES



Note:
1 - Required Deliverable

P/S - Planning & Scheduling

MODIS DATA SYSTEM REQUIREMENTS QUESTIONNAIRE

Investigator: Dr. Joel Susskind

Date: October 5, 1988

Address: Code 611

Goddard Space Flight Center

Greenbelt, MD 20771

Phone: (301) 286-7210

Electronic Address:

1. Science Data Product:

   Cloud Parameters

2. Definition (include SI unit):

   Cloud Top Pressure (CTP) (mbar)
   Outgoing Longwave Radiation (OLR) (w/m^2)
   Longwave Cloud Radiative Forcing (LCRF) (w/m^2)
   Precipitation Estimate (mm)
   Cloud Fraction (CF) (%)

3. Spatial and Temporal Resolution and Coverage Requirements (include current capabilities and the goals for the MODIS):

   Not well established.

4. Accuracy Requirements (include current capabilities and the goals for the MODIS):

   CTP: $\pm$ 25 - 50 mbar
   OLR: $\pm$ 6 w/m^2
   LCRF: $\pm$ 2 w/m^2
   Precip: TBD
   CF: $\pm$ 5%

5. Input Data Required

5.1 MODIS sensor channels

MODIS-T:

None.

MODIS-N:

All 15 thermal IR channels.

5.2 Ancillary data (i.e., data from polar platform, including other sensors):

Level 2 AIRS/AMSU at 50 KM horizontal resolution:
Temperature Profile
Moisture Profile
Surface Temperature

5.3 Delivery requirements (where, when, how, and how often):

Must be continuously available to CDHF within 24 hours.

6. Level 1 Processing Requirements

6.1 Calibration accuracy:

MODIS Specification.

6.2 Calibration scenarios (sensor, surface, and data):

6.3 Instrument long-term stability requirements (state both the requirement and the reason for the requirement):

6.4 Scenarios for monitoring instrument trends:

To check for bias errors in MODIS calibration, observed MODIS radiances will be compared to simulated MODIS radiances calculated from AIRS channels. Clear scenes will be used for this comparison.

6.5 Anticipated Recalibration Requirements (upper limit):

Every 3 years.

6.6 Earth location accuracy requirements (include methods for attaining the stated accuracy):

Coregistration of spectral channels to ± 10% of pixel size.

6.7 Level 1 data products

6.7.1 Description of Level 1A data products (list ancillary data to be merged with sensor data):

None.

6.7.2 Description of Level 1B data products (include strategies for segmentation, and logical record organization):

Time sequential, full resolution, radiometrically calibrated.

6.7.3 Desired distribution media:

Electronically transmitted into processor.

6.7.4 Delivery requirements (where, when, how, and how often):

6.8 References (for calibration, trend analysis, and Earth location):

7. Parameter Retrieval Algorithms

7.1 Algorithm description (include description of how input data are used by the algorithm):

CTP/CF algorithm: use the surface temperature and the temperature and moisture profiles to compute radiances for the 5 MODIS channels (#36-40) as a function of CTP and CF. Assume CTP and vary CF to produce best fit by using a "search algorithm"..

Using CF, CTP and moisture profile, calculate precipitation estimate. Use all parameters to calculate OLR and LWCF.

7.2 Limitations of the algorithm (e.g., accuracy limitation, limited parameter range of validity, etc.):

Accuracy limited by multilayer clouds and will not be established until 1 km data are used.

7.3 Discussion of algorithm development status:

7.4 Estimates of computing resources

7.4.1 CPU:

Current processing of soundings at 60 km resolution requires 20 min/day on CYBER-205 Cloud Algorithm ~ 5% of this. OLR calculation yields factor of 3. At 1 km resolution:

180 hrs. CYBER 205 time/day

7.4.2 Memory:

MODIS-N Level 1B radiances (15 longwave channels)

.16 Tb/day

7.4.3 Lines of code (specify language):

10,000 lines of code.

7.5 References:

J. Susskind et al., Cloud Fields Retrieved from Analysis of HIRS2/MSU Sounding Data, J. Geophys. Res., 92, 4035-4050, 1987.

8. Level 2 Data Products

8.1 Estimate of data volume:

8.2 Desired distribution media:

Derived Level 2 cloud products.
.05 Tb/day.

8.3 Delivery requirements:

72 hours from observation.

9. Level 3 Requirements

9.1 Description of standard mapped data products (include bin sizes for spatial and/or temporal averages; also indicate type of projections desired (e.g., Mercator and/or polar stereographic projections):

TBD but gridded at 1^{o} or $1/2^{o}$ or at full resolution are possibilities, also several day averages may be useful.

9.2 Estimate of data volume:

9.3 Desired distribution media:

9.4 Delivery requirements:

10. Validation Requirements

10.1 Use of in-situ data

10.1.1 Description of in situ data (include accuracy requirements):

OLR from MODIS will be compared to OLR from ERBI.
Precip. will be compared to rain gauges, radar data.
CTP will be compared to GLRS cloud topography.

10.1.2 Description of in situ experiment (in situ experiment planned for supporting MODIS or current ongoing experiment that may help in validating MODIS-derived parameters):

None.

10.1.3 Comparison procedure (describe how the MODIS-derived parameter values are compared with the ground truth measurements. Include descriptions of statistical methods, mapping overlays, mathematical methods of analysis, graphical methods, etc.):

10.1.4 Description of current in-situ validation efforts:

10.1.5 Near real-time requirements for field experiments or target-of-opportunity observations:

10.1.6 References for in situ experiments and validation efforts:

10.2 Use of geophysical models

10.2.1 Description of the model:

No really good models exist.

10.2.2 Description of model inputs/outputs (include accuracy limitations of the model):

10.2.3 Procedures for using the model for validation (include descriptions of analysis methods and accuracy limitations):

10.2.4 Discussion of current modeling validation efforts:

10.2.5 Estimate of computing resources

10.2.5.1 CPU:

10.2.5.2 Memory:

10.2.5.3 Lines of code (specify language):

10.2.6 References for modeling validation efforts:

11. Browse Data Products

11.1 Product descriptions:

Desirable, but TBD.

11.2 Estimate of data volume:

11.3 Frequency estimate (how often will browse be used?):

12. Existing Data Products from Precursors to MODIS

12.1 Brief description of products (identify sensors and aircrafts and/or spacecrafts that carried the sensors):

12.2 References to existing data products:

13. User Data Access Requirements

14.1 State the characteristics required for user selection of data. State the required resolution of physical characteristics (e.g., time to within 1 second or 1 day, etc.)

Time:

Latitude:

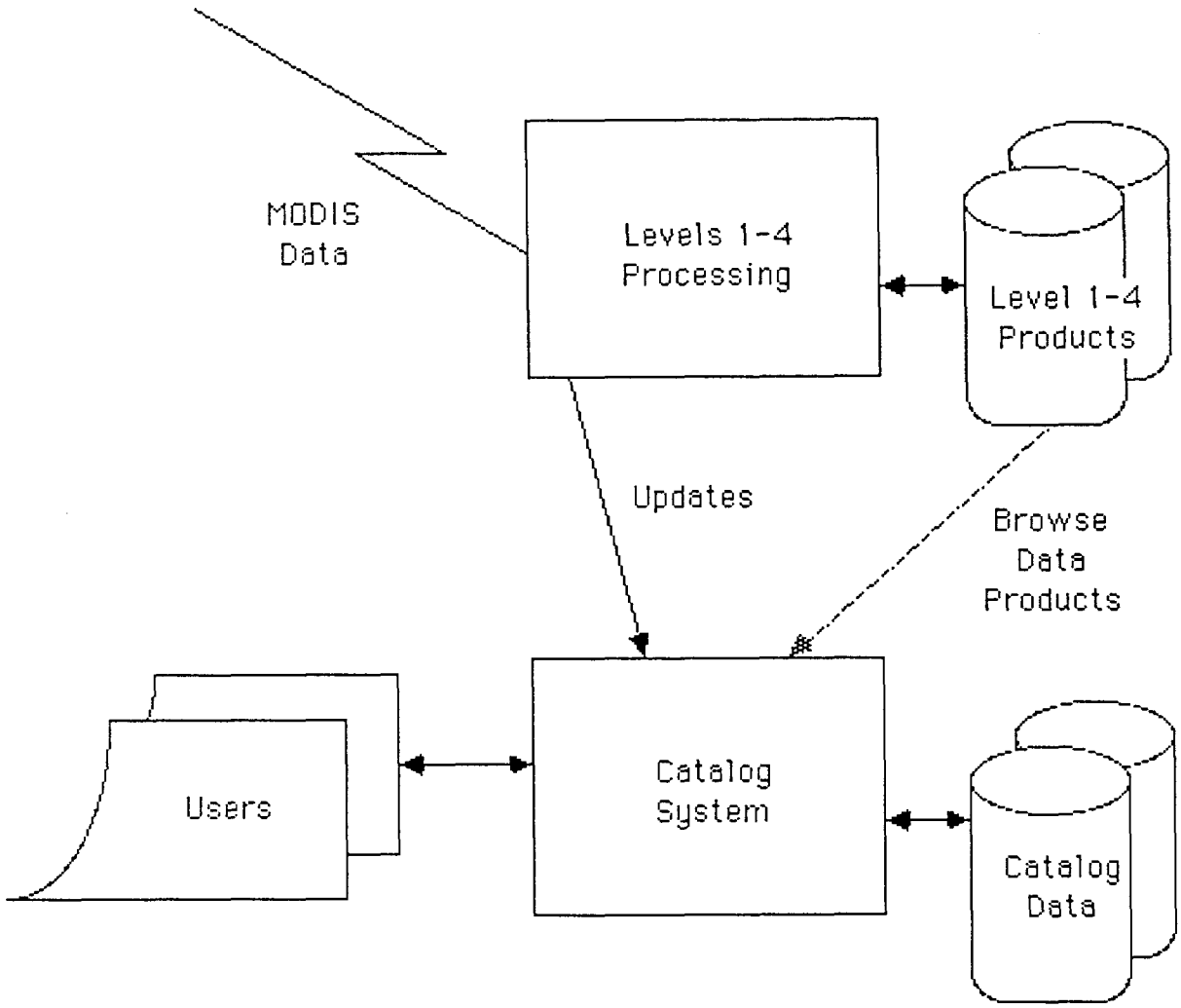
Longitude:

Other:

14.2 How quickly must users acquire data from the archive?

14.3 Estimated the number of data requests per year:

14.4 Estimated volume of data requests (maximum, minimum, and average volume of single data requests):



Processing to Support user Queries of Available Products

The user terminals for the catalog system processor are located in the IMC. The system provides a database users can query to determine the availability of MODIS data relevant to their scientific disciplines. A TBD quantity of browse data products is also available. The metadata comprising this system is produced as part of Levels 1-4 processing.

Issues still to be resolved include identifying the processor(s) and architecture, use of a commercial database management system, and any additional metadata deemed necessary for MODIS product selection.

DATA ELEMENTS (METADATA) THAT DESCRIBE MODIS DATA

MODIS-N and -T Sensor ID

Product Sequence Number/Version Number

Processing Date

Start Time

Stop Time

Orbit Number

Geographical Coordinates

Data Quality

Land or Ocean

Cloudiness

Instrument Tilt

Scan Numbers

Attitude

Ephemeris

Time Code

Solar Zenith Angle

Satellite Zenith Angle

Processing Level

Earth Zenith Angle

Earth Location

Parameter

ACTION ITEMS:

9/16-1: (McKay) Does MIDACS need to request Level 0 data from the DHC routinely, or will the DHC send Level 0 data to MIDACS as soon as it is ready without an explicit request?

9/30-1: (Han) Provide a list of candidates to send the MODIS Data System Questionnaires to.

9/30-2: (Ardanuy) Define conceptually how the science team members will get their data (assume that the TMCF is distributed and that 9.6 kbps is not a sufficiently high data rate).

9/30-3: (Folta) Under what conditions will the DADS release data? Will the data be released automatically unless there is a notification to hold the data or will the data only be released upon explicit authorization of the science team?